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PATENT

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Applicants: Hiromi NAKASE et al.
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VERIFICATION OF A TRANSLATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SIR:

I, the below named translator, hereby declare that:

1. My name and post office address are as stated below.
2. That I am knowledgeable in the English language and the Japanese language.
3. The attached document is an English translation of Japanese Application 2002-362533 which was filed with the Japanese Patent Office on December 13, 2002.
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to

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be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

March 23, 2007

Date

Tsuyoshi MORI

Full name of the Translator

Tsuyoshi Mori

Signature of the Translator

c/o Ariga International Patent Office

Shinjuku Sanshin Building 2-4-9, Yoyogi, Shibuya-ku, Tokyo, JAPAN

Post Office Address

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[DOCUMENT NAME] SPECIFICATION

[TITLE OF THE INVENTION] OPTICAL DISC APPARATUS

[SCOPE OF THE CLAIM FOR PATENT]

[Claim 1]

5 An optical disc apparatus, comprising:

an optical unit for projecting a laser light to an optical disc and converting a reflection light reflected from said optical disc into an electrical signal;

10 signal processing means for processing said electrical signal from said optical unit to have said electrical signal converted into reproduction information required for reproduction;

parameter storage means for storing therein a parameter contained in said reproduction information from said signal processing means; and

reproduction time computing means for computing a reproduction time based on said parameter stored in said parameter storage means.

15

[Claim 2]

An optical disc apparatus as set forth in claim 1, which further comprises optical disc reproduction means for determining a reproduction start position based on said parameter stored in said parameter storage means.

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[DETAILED DESCRIPTION OF THE INVENTION]**[0001]****[TECHNICAL FIELD OF THE INVENTION]**

The present invention relates to an optical disc apparatus for resuming reproduction of information recorded on an optical disc, and more particularly to an optical disc apparatus for obtaining reproduction time information even if the reproduction time information is not contained as address information in compressed audio information recorded on an optical disc, and resuming reproduction of the compressed audio information on the basis of the reproduction time information in the even that a power supply to the optical disc apparatus is turned off in the midst of the reproduction of the compressed audio information, and then turned on.

[0002]**[PRIOR ART]**

The conventionally optical disc apparatus is designed to store address information indicative of a reproduction position of information recorded on an optical disc, and to start reproduction of the information on basis of the stored address information (hereinafter simply referred to as "resume reproduction") when a power supply to the optical disc apparatus is turned off in the midst of reproduction of the information, and then turned on (see patent document 1).

[0003]

[patent document 1]

[0004]

Japanese Patent Laid-Open Publication No. 2002-230781 (see paragraphs 0005 and

25 0006)

[0005]**[PROBLEMS TO BE SOLVED BY THE INVENTION]**

Compressed audio data represented by, for example, MP3 (MPEG-1 Audio Layer-3) emerged in recent years may not include information on a reproduction time (hereinlater simply referred to as "reproduction time information") in the address information of the optical disc. However, the conventional optical disc apparatus can not obtain reproduction time information, and resume reproduction of the compressed audio data in the even that the power supply was turned off, and then turned on, resulting from the fact that the conventional optical disc apparatus is simply designed to start reproduction of the compressed audio data on the basis of the address information without extracting the reproduction time information from the address information.

[0006]

It is therefore an object of the present invention to provide an optical disc apparatus which can compute a reproduction time, even if the reproduction time information is not contained as address information in compressed audio information, and to resume 5 reproduction of the compressed audio information on the basis of the computed reproduction time in the even that the power supply to the optical disc apparatus is turned off in the midst of the reproduction of the compressed audio information, and then turned on.

10 [0007]**[MEANS FOR SOLVING THE PROBLEMS]**

In order to solve the above-mentioned problem, there is provided an optical disc apparatus, comprising; an optical unit for projecting a laser light to an optical disc and converting a reflection light reflected from the optical disc into an electrical signal; signal 15 processing means for processing the electrical signal from the optical unit to have the electrical signal converted into reproduction information required for reproduction; parameter storage means for storing therein a parameter contained in the reproduction information from the signal processing means; and reproduction time computing means for computing a reproduction time based on the parameter stored in the parameter storage 20 means. The reproduction information herein used is intended to mean data required for reproduction of music data, image data, and the like. The parameter herein used is intended to mean information on address number, bit rate, monaural/stereo and the like.

[0008]

The optical disc apparatus thus constructed according to the present invention can 25 compute a reproduction time information, even if the reproduction time information is not contained as address information in compressed audio information, and to resume reproduction of the compressed audio information on the basis of the computed reproduction time in the even that the power supply to the optical disc apparatus is turned off in the midst of the reproduction of the compressed audio information, and then turned on, 30 resulting from fact that the optical disc apparatus is operative to compute a reproduction time based on the parameter contained in the reproduction information.

[0009]

The optical disc apparatus according to the present invention further comprises 35 optical disc reproduction means for determining a reproduction start position based on the parameter stored in the parameter storage means.

[0010]

The optical disc apparatus thus constructed according to the present invention can compute a reproduction time, even if the reproduction time information is not contained as address information in compressed audio information, and resume reproduction of the compressed audio information on the basis of the reproduction time in the even that the power supply to the optical disc apparatus is turned off in the midst of the reproduction of the compressed audio information, and then turned on, resulting from the fact that the optical disc apparatus is operative to determine a reproduction start position based on the parameter stored in the parameter storage means.

10 [0011]

[EMBODIMENTS OF THE INVENTION]

The construction of the optical disc apparatus according to one embodiment of the present invention will be firstly described hereinafter with reference to FIG. 1. Here, the optical disc apparatus 100 is intended to mean an apparatus for projecting a laser light to a pit formed on an optical disc 200 and detecting a reflection light reflected from the pit formed on the optical disc 200 to have the reflection light converted to an information signal to be reproduced therethrough. The optical disc 200 may be constituted by a compact disc (hereinlater simply referred to as "CD"), a digital versatile disc (hereinlater simply referred to as "DVD"), and the like. It is assumed in the description about the present embodiment that the optical disc 200 is constituted by a CD for the purpose of simplicity but it is of course needless to mention that the optical disc 200 may be constituted by any other storage medium.

[0012]

As shown in FIG. 1, the optical disc apparatus 100 according to the present invention comprises a spindle motor 101 for driving the optical disc 200 to have the optical disc 200 rotated, a spindle motor driving circuit 102 for controlling the spindle motor 101 to have the spindle motor 101 rotated at a predetermined number of rotations per second, and an optical unit 103 including a semiconductor laser source, not shown, for projecting a light beam to the optical disc 200 and a photoelectric conversion element, not shown, for receiving a reflection light reflected from the optical disc 200 to have the reflection light converted to an electric signal.

[0013]

The optical disc apparatus 100 further comprises a laser driving circuit 104 for controlling the optical unit 103 to have the optical unit 103 project the light beam at an arbitrary level, an objective lens 105 intervening between the optical unit 103 and the optical disc 200 to have the reflection light reflected from the optical disc 200 focused on

the photoelectric conversion element forming part of the optical unit 103, an actuator unit 106 for actuating the objective lens 105, and actuator control means 107 for controlling the actuator unit 106 to have the actuator unit 106 actuate the objective lens 105 between the optical unit 103 and the optical disc 200. Here, the actuator unit 106 is constituted by a
5 focus actuator 106a for actuating the objective lens 105 to have an optical spot of the objective lens 105 moved along a focus direction parallel to an optical axis of the objective lens 105 and a tracking actuator 106b for actuating the objective lens 105 to have the optical spot of the objective lens 105 moved along a radial direction of a track of the optical disc 200.

10 [0014]

The optical disc apparatus 100 further comprises a radio frequency circuit (RF circuit) 108 for producing a radio frequency signal (RF signal) and an error signal such as for example a focus error signal, a tracking error signal, and the like, based on the electrical signal from the optical unit 103, a servo control circuit 109 for driving the spindle motor driving circuit 102 and the actuator control means 107 to have the spindle motor driving circuit 102 and the actuator control means 107 respectively controlled based on the error signal from the RF circuit 108, and a signal processing circuit 110 for converting the RF signal from the RF circuit 108 into reproduction information such as, for example, sound information, image information and the like. Here, the signal processing circuit 110
15 functions as signal processing means according to the present invention.
20 [0015]

The optical disc apparatus 100 further comprises a dynamic random access memory (DRAM) 111 for storing therein reproduction information and the like, a read only memory (ROM) 112 for storing therein a control program executable to control the whole operation of the optical disc apparatus 100, and a central processing unit (hereinafter simply referred to as "CPU") 113 for executing the control program stored in the ROM 112. Here, the DRAM 111 functions as parameter storage means, the ROM 112 and the CPU 113 collectively function as reproduction time computing means and optical disc reproduction means to compute a reproduction time based on parameters stored in the DRAM 111 and to
25 determine a reproduction start position based on the parameters stored in the DRAM 111 after the optical disc apparatus 100 is rebooted. The parameters stored in the DRAM 111 include, for example, but not limited to, information on address number, bit rate, monaural/stereo and the like.
30 [0016]

35 The operation of resuming reproduction performed by the optical disc apparatus 100 according to the embodiment of the present invention will be then described hereinafter

with reference to a flow chart shown in FIG. 2. The CPU 113 is operated to execute the control program stored in the ROM 112 to control the optical disc 200 to have the optical disc 200 rotated (in step S101). At this time, a reflection light reflected from the optical disc 200 is converted into an electric signal by the optical unit 103. The electric signal is
5 then converted into reproduction information by the RF circuit 108 and the signal processing circuit 110.

[0017]

When the reproduction information is obtained, step S101 goes forward to step S102, in which the CPU 113 is operated to execute the control program stored in the ROM 112 to store parameters contained in the reproduction information in the DRAM 111. In
10 addition, the CPU 113 is operated to execute the control program stored in the ROM 112 to update the parameters stored in the DRAM 111 whenever the parameters contained in the reproduction information have changed.

[0018]

15 The judgment is then made (in the step S103) on whether or not a power supply, not shown, of the optical disc apparatus 100 is turned off. When the power supply to the optical disc apparatus 100 is not turned off, step S103 goes back to step S102. When, on the other hand, the power supply to the optical disc apparatus 100 is turned off, and then turned on, the optical disc apparatus 100 is rebooted (in the step S104).

[0019]

20 When the power supply to the optical disc apparatus 100 is turned off, and then turned on, the optical disc apparatus 100 is rebooted, step S104 goes forward to step S105, in which the CPU 113 executes the control program stored in the ROM 112 to read, from the DRAM 111, parameters corresponding to the time when the power supply to the optical
25 disc apparatus 100 was turned off.

[0020]

When the CPU 113 reads, from the DRAM 111, the parameters corresponding to the time when the power supply to the optical disc apparatus 100 was turned off, step S105 goes forward to step S106, in which the CPU 113 executes the control program stored in the ROM 112 to compute, based on the parameters read from the DRAM 111 in accordance with following expressions, a reproduction time corresponding to the time when the power supply to the optical disc apparatus 100 is turned off.
30

[0021]

Monaural sound:

35 Reproduction time (sec.) = {the Number of Addresses/Bit Rate (kbp/sec.)}/1

Stereo sound:

Reproduction time (sec.) = {the Number of Addresses/Bit Rate (kbp/sec.)}/2

The first expression is used for the optical disc of the monaural recording format, while the second expression is used for the optical disc of the stereo recording format.

[0022]

5 When the CPU 113 computes a reproduction time from the parameters read from the DRAM 111, step S106 goes forward to step S107, in which the CPU 113 executes the control program stored in the ROM 112 to produce a control signal to have a display unit (not shown) display the reproduction time, and to produce a signal to resume reproduction of music data, image data, and the like on the basis of parameters corresponding to the
10 number of addresses when the power supply to the optical disc apparatus 100 was turned off in the midst of the reproduction of the compressed audio information, and then turned on (in step S107).

[0023]

15 From the foregoing description, it will be understood that the optical disc apparatus according to the embodiment of the present invention can obtain reproduction time information, even if the reproduction time information is not contained as address information in compressed audio information, in the event that the power supply to the optical disc apparatus is turned off in the midst of reproduction of the compressed audio information, and then turned on, resulting from the fact that the optical disc apparatus is
20 operative to compute a reproduction time from the number of addresses and bit rate contained in the reproduction information.

[0024]

25 From the foregoing description, it will be understood that the optical disc apparatus according to the embodiment of the present invention can obtain reproduction time information, and resume reproduction of the compressed audio information on the basis of the obtained reproduction time information, even if the reproduction time information is not contained as address information in compressed audio information, in the event that the power supply to the optical disc apparatus is turned off in the midst of reproduction of the compressed audio information, and then turned on, resulting from the fact that the optical
30 disc apparatus is operative to determine a start position on the basis of the number of addresses stored in DRAM 111.

[0025]

[EFFECTIVENESS OF THE INVENTION]

35 As will be seen from the foregoing description, the optical disc apparatus according to the present invention can obtain reproduction time information from a parameter

contained in reproduction information, even if the reproduction time information is not contained as address information in compressed audio information, in the event that the power supply to the optical disc apparatus is turned off in the midst of reproduction of the compressed audio information, and then turned on.

5

[BRIEF DESCRIPTION OF THE DRAWINGS]

[FIG. 1]

FIG. 1 is a block diagram showing the optical disc apparatus according to the embodiment of the present invention.

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[FIG. 2]

FIG. 2 is a flow chart showing an operation of resuming reproduction performed by the optical disc apparatus according to the embodiment of the present invention.

[EXPLANATION OF THE REFERENCE NUMERALS]

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103: optical unit

110: signal processing circuit (signal processing means)

111: DRAM (parameter storage means)

112: ROM (reproduction time computing means, optical disc reproduction means)

113: CPU (reproduction time computing means, optical disc reproduction means)

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[NAME OF DOCUMENT] ABSTRACT**[ABSTRACT]****[PROBLEM]**

It is an object of the present invention to provide an optical disc apparatus which
5 can compute a reproduction time from a parameter contained in reproduction information,
even if the reproduction time information is not contained as address information in
compressed audio information, even if the power supply to the optical disc apparatus is
turned off in the midst of reproduction of the compressed audio information, and then turned
on.

10 [MEANS FOR SOLVING]

In the optical disc apparatus according to the present invention, the CPU 113
executes a control program stored in the ROM 112 to compute, based on a parameter from
the DRAM 111, a reproduction time corresponding to the time when the power supply to the
optical disc apparatus was turned off. Then, the CPU 113 executes the control program
15 stored in the ROM 112 to produce a control signal to have a display unit (not shown) display
the reproduction time, and to produce a signal to resume reproduction of music data, image
data, and the like on the basis of the reproduction time even if the power supply to the
optical disc apparatus is turned off in the midst of the reproduction of the compressed audio
information, and then turned on.

20 [SELECTED DRAWING] FIG. 2